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Modelling Spatial Dependence or Social Interactions

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Spatial dependence or social interaction among economic agents or social actors, such as neighbourhood effects, copy-catting, and peer group effects, has recently received increased attention from regional scientists, economists, econometricians, and statisticians.

In the broad field of economics, there is a growing recognition that standard econometric techniques often fail in the presence of spatial interactions.

As a result, spatial econometric models and methods have been applied not only ir specialised fields such as regional science, urban economics, real estate and economic geography, but also increasingly in more traditional fields of economics as well, including demand analysis, labour economics, public economics, international economics, anc agricultural and environmental economics.

While, conceptually, the principle underlying the resulting spatial dependence is straightforward, the precise way in which this dependence should be included in a regressior model is rather complex. Very recently, the notions of local and global externalities, or short- and long-range spatial dependence, brought up by Luc Anselin (2003, *International Regiona Science Review*), have caught the attention of many econometricians and applied researchers Anselin provided a comprehensive taxonomy of spatial econometric models according tc different kinds of spatial externalities, in an effort to better reconcile econometric practice with theoretical developments. However, important issues such as estimation and testing fo certain models, joint modelling and testing of local and global spatial externalities, anc modelling the spatial externalities for panel data have not been satisfactorily addressed particularly in the area of econometric theories.

In a recent article, "On Joint Modelling and Testing for Local and Global Spatia Externalities", (presented and discussed at the International Workshop on Spatial Statistics and Econometrics, 2006, Luiss Business School, Rome, Italy), Prof Yang proposed a mode that jointly takes into account local and global externalities. The proposed model contains al the models discussed in Anselin (2003) and other popular models available in the literature He develops robust methods of model estimation (in the sense that the error distributions dc not need to be specified), joint or marginal tests for testing the existence of local and globa externalities (allowing practitioners to choose a suitable model for their own studies), anc sound econometric theories (in supporting the practical applications of the proposec methodologies).

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In another recent article, "Quasi-Maximum Likelihood Estimation for Spatial Panel Data Regression", (presented at the Far Eastern Meeting of The Econometric Society 2006, Tsinghua University, Beijing, China), Prof Yang extended the modelling of spatial dependence to panel data (i.e. data collected on a set of individuals over a certain period of time), allowing the presence of a flexible functional form relationship in the model. Research in spatial panel data regression often assumes that the data (in original log form) follow normal distributions. In practical applications, however, economic data are often non-normal and a common practice is to transform the data before fitting the model. While the proposed transformed panel model is preferable for modelling economic panel data, it renders the standard estimation techniques, such as the generalised least squares and the generalised method of moments, inapplicable. Thus, the quasi-maximum likelihood (QML) estimation technique is a natural choice for this model which provides a two-way protection against non-normality of data.

In this article, Prof Yang develops the QML estimates of the model parameters and provides a simple method for estimating the standard errors. He then provides a rigorous examination of the theoretical properties of the model.

Finally, using data on US state demand for cigarettes, he finds strong evidence for the existence of spatial dependence among the neighbourhood states, and for the use of general "power transformation" functional form rather than the traditional log-log form.

The importance and contributions of these articles are as follows: i) The methodological developments will be useful and provide important additions to the literature of spatial econometrics and panel data regression; and ii) The new models and inference methods can be used for analysing economic and social data where spatial dependence among the "agents" is common, resulting in more meaningful analyses and insightful information about economic and social activities, particularly when taking into account the advantages of the more informative panel data.

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